Hammerhead Ultradeepwater Integrated Completion and Production System

Improve recovery and minimize operational risk in frontier plays

The Hammerhead™ system is a built-for-purpose, integrated completion and production solution that allows operators to reliably access and economically produce high-pressure/high-temperature (HP/HT) ultradeepwater reservoirs. The system is designed for wells as deep as 33,000 ft (10,060 m) total vertical depth, located in water depths up to 10,000 ft (3050 m), and offers reliable performance in pressures and temperatures up to 25,000 psi (1,724 bar) and 300°F (150°C). This first-to-market wellhead-to-reservoir solution addresses all aspects of the product life cycle, including safety, reliability, quality, manufacturability, and operations.

Fully assembled, the system includes an upper completion, an isolation assembly, a lower completion, and intelligent production capabilities. The lower completion features a 5¾-in. minimum production inside diameter—the industry’s largest for a high pressure 8½-in. drift completion. The system is capable of handling sustained flow rates up to 30,000 bpd with high differential pressures up to 15,000 psi (1034 bar), and is fully compatible with subsea boosting technology, supporting reduced abandonment pressures and maximum reservoir drainage.

The lower completion, including screens, sleeves, and packers, is run in hole in a single trip, and features a high-performance frac-pack system designed and tested for extreme rates, pressures, and temperatures. The frac-pack system is engineered to increase reliability and simplify operations through positive tool indications that enable greater set-down weight and higher upstrain. When supported by advanced stimulation vessels, the frac-pack system can deliver as much as 5,000,000 lb (2,267,960 kg) of proppant at up to 50 bbl/min, into as many as five zones, ensuring optimal reservoir connectivity and conductivity for increased hydrocarbon flow.

Selective shifting profiles allow the lower portion of the isolation assembly to be run into the lower completion before any sleeves are opened, minimizing fluid loss into the formation. A mechanical barrier is included to maintain reliable well control during upper completion installation.

Downhole wet-mate technology allows distributed temperature sensing fiber-optic cables to be placed inside the lower completion and then brought online during production. Once the well is turned

Applications
- Cased-hole producers
- HP/HT environments
- Ultradeepwater applications
- Subsea installations

Features and benefits
- Integrated system-based design and testing
  - Eliminates multi-vendor tool integration issues
- Single-trip, multizone lower completion
  - Enables high stimulation rates of up to five zones with large proppant volumes
  - Achieves maximum reservoir connectivity, even in low-permeability formations
  - Supports set-down weight for added reliability
  - Reduces operational time
- Industry’s largest production ID
  - Enables production rates up to 30,000 bpd
- 15,000 psi differential pressure
  - Supports HP/HT environments
  - Enables maximum reservoir drainage
- Chemical injection valves
  - Enable delivery of chemical flow-assurance solutions
- Surveillance and control capabilities
  - Enable proactive reservoir management
- Fluid loss control system
  - Provides reliable well control while the upper completion is installed
on, surveillance and control capabilities permit remote monitoring and facilitate selective zonal control with dual choking, hydraulic intelligent well system valves for proactive reservoir management. The system enables operators to selectively control zones to optimize production, and deliver flow assurance technology as needed via chemical injection valves, helping to avoid costly production interruptions and ensuring sustained hydrocarbon flow.

With the integrated system, operators can reliably access Lower Tertiary reservoirs and maintain long-term production, safely and reliably, for full-field economic payback.

Contact your Baker Hughes representative today or visit www.bakerhughes.com/Hammerhead to learn more about how our Hammerhead system can help you secure planned returns in frontier plays.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing size</td>
<td>8.5 in. (216 mm) drift</td>
</tr>
<tr>
<td>Sand control system bore size</td>
<td>5.250 in.</td>
</tr>
<tr>
<td>Temperature rating</td>
<td>65 to 300°F (18 to 149°C)</td>
</tr>
<tr>
<td>Reservoir pressure</td>
<td>25,000 psi (1724 bar)</td>
</tr>
<tr>
<td>Differential pressure</td>
<td>15,000 psi (1034.2 bar)</td>
</tr>
<tr>
<td>Production rate</td>
<td>30,000 bpd (2068 bar)</td>
</tr>
<tr>
<td>Well stimulation – frac port rating</td>
<td>5,000,000 lb (344 738 bar)</td>
</tr>
<tr>
<td>Well stimulation – flow rate</td>
<td>50+ bpm</td>
</tr>
</tbody>
</table>